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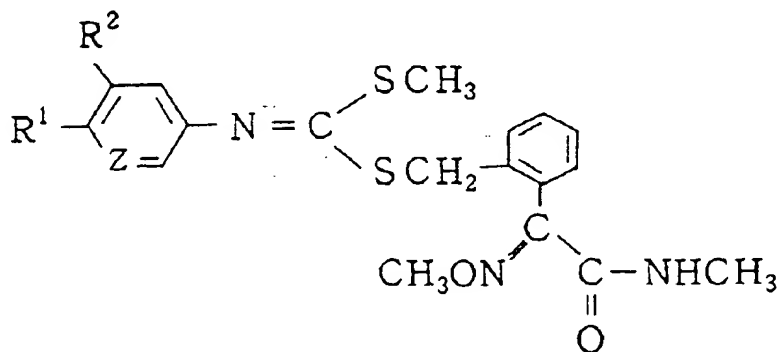
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(54) Microbicidal composition

(57) There is disclosed a microbicidal composition comprising as active ingredients:

(I) a dithiocarbonimide compound represented by the general formula:



wherein Z represents a CH group or a nitrogen atom, R¹ and R² are the same or different and represent a hydrogen atom, a C₁-C₆ alkyl group, a halogen atom, a C₁-C₆ alkoxy group, a C₁-C₆ haloalkyl group or a C₁-C₆ haloalkoxy group, or R¹ and R² are taken together to form a methylenedioxy group optionally substituted with fluorine atoms, and

(II) at least one compound selected from the group consisting of ethylenebis(dithiocarbamate) compound, copper compound, phthalimide microbicidal compound, chlorothalonil, anilide microbicidal compound, cymoxanil, dimethomorph and fosetyl.

EP 0 792 583 A1

not relevant

Description

The present invention relates to a microbicidal composition. More particularly, the present invention relates to a microbicidal composition showing the superior effects of controlling diseases caused by Oomycetes.

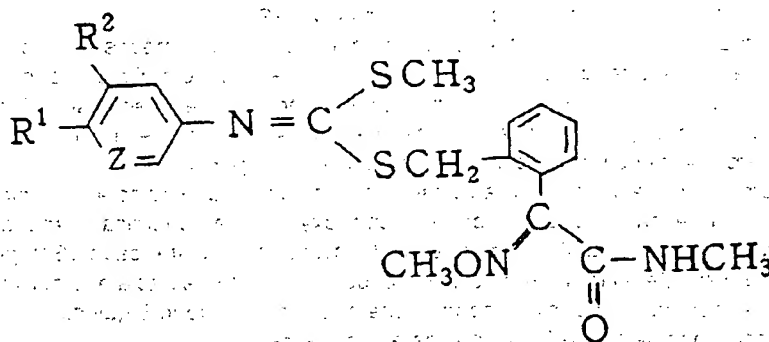
There have been hitherto known many microbicidal compositions. However, many of diseases caused by Oomycetes have the rapid development of disease symptom once attacked with Oomycetes, and its pathogenic microorganism spreads rapidly by secondary infection. Therefore, the diseases caused by Oomycetes are difficult to effectively control. Thus, there is a great demand for a microbicidal composition showing the superior effects of controlling the diseases caused by Oomycetes.

A main object of the invention is to provide a microbicidal composition having the superior effects of controlling the diseases caused by Oomycetes.

This object as well as other objects and advantages of the present invention will become apparent to those skilled in the art from the following description.

The present invention solves the above problems and provides a microbicidal composition comprising as active ingredients:

(I) a dithiocarbonimide compound (referred to as "Compound (I)" hereinafter) represented by the general formula:



wherein Z represents a CH group or a nitrogen atom; R¹ and R² are the same or different and represent a hydrogen atom, a C₁-C₆ alkyl group, a halogen atom, a C₁-C₆ alkoxy group, a C₁-C₆ haloalkyl group or a C₁-C₆ haloalkoxy group, or R¹ and R² are taken together to form a methylenedioxy group optionally substituted with fluorine atoms, and

(II) at least one compound (referred to as "Compound (II)" hereinafter) selected from the group consisting of ethylenebis(dithiocarbamate) compound, copper compound, phthalimide microbicidal compound, chlorothalonil, anilide microbicidal compound, cymoxanil, dimethomorph and fosetyl.

At first, Compound (I) is explained.

In the above general formula, examples of a C₁-C₆ alkyl group represented by R¹ and R² are methyl and ethyl. Examples of a halogen atom are fluorine and chlorine. Examples of a C₁-C₆ alkoxy group are methoxy and ethoxy. An example of a C₁-C₆ haloalkyl group is trifluoromethyl. An example of a C₁-C₆ haloalkoxy group is trifluoromethoxy.

Compound (I) can be prepared by a method described in EP-A-0656351.

The embodiments of Compound (I) are shown together with the compound numbers in Table 1 (The embodiments are shown by the definition of respective substituents in the compound represented by the general formula).

Compound No.	Z	R ¹	R ²
(Ia)	CH	CH ₃	H
(Ib)	CH	C ₂ H ₅	H
(Ic)	CH	OC ₂ H ₅	H
(Id)	CH	CF ₃	H
(Ie)	CH	OC ₂ H ₅	F
(If)	CH	OCF ₂ O	
(Ig)	N	OC ₂ H ₅	H
(Ih)	CH	CF ₃ O	H

Then, Compound (II) is explained. Each page cited after the name of each compound represents the page where each compound is described in "The Pesticide Manual, Tenth Edition (edited by Clive Tomlin, published by The British Crop Protection Council and The Royal Society of Chemistry, 1994)".

In the present invention, the ethylenebis(dithiocarbamate) compound means a salt of ethylenebis(dithiocarbamate) such as zinc salt [general name: zineb; chemical name: zinc ethylenebis(dithiocarbamate) (polymeric), page 1048], manganese salt [general name: maneb; chemical name: manganese ethylenebis(dithiocarbamate)(polymeric), page 637] and salt of zinc and manganese [general name: manzeb; another name: mancozeb; chemical name: manganese ethylenebis(dithiocarbamate)(polymeric) complex with zinc salt, page 635].

The copper compound means an inorganic salt of copper which is used as a microbicidal agent (such as chloride, oxychloride [general name: basic copper chloride (copper oxychloride); chemical name: dicopper chloride trihydroxide (approximate composition), page 230], carbonate, oxide, hydroxide, sulfate (page 231), phosphate, silicate, zinc chromate and hydrazinium sulfate) and an organic salt of copper which is used as a microbicidal agent (such as acetate, 8-hydroxyquinolinolate [general name: oxine-copper; chemical name: cupric 8-quinolinoxide, page 758], oxalate, bis(3-phenylsalicylate), naphthenate (page 716), linolenate and oleate).

The phthalimide microbicidal compound means N-(trichloromethylthio)phthalimide (general name: folpet, page 518) which is a compound having the N-substituted phthalimide structure, and N-(trichloromethylthio)cyclohex-4-ene-1,2-dicarboximide (general name: captan, page 145) and N-(1,1,2,2-tetrachloroethylthio)cyclohex-4-ene-1,2-dicarboximide (general name: captafol, page 143) which are compounds having the N-substituted tetrahydrophthalimide structure.

Chlorothalonil (general name) means tetrachloroisophthalonitrile (page 193).

The anilide microbicidal compound means a compound having the 2,6-dimethylanilide structure such as metalaxyl (general name){chemical name: methyl N-(2,6-dimethylphenyl)-N-(methoxyacetyl)alaninate, page 660}, benalaxyl (general name){chemical name: methyl N-(2,6-dimethylphenyl)-N-(phenylacetyl)alaninate, page 71}, furalaxyl (general name){chemical name: methyl N-(2,6-dimethylphenyl)-N-(2-furanylcarbonyl)alaninate, page 534}, ofurace (general name){chemical name: 2-chloro-N-(2,6-dimethylphenyl)-N-(tetrahydro-2-oxo-3-furanyl)acetamide, page 745} and oxadixyl (general name){chemical name: 2-methoxy-N-(2-oxo-1,3-oxazolidin-3-yl)aceto-2',6'-xylydide, page 755}, and a compound having the 3-chloroanilide structure such as cyprofuram (general name){chemical name: N-(3-chlorophenyl)-N-(tetrahydro-2-oxo-3-furanyl)cyclopropanecarboxamide, page 1076}.

Cymoxanil (general name) means 2-cyano-N-[(ethylamino)carbonyl]-2-(methoximino)acetamide (page 257).

Dimethomorph (general name) means 4-[3-(4-chlorophenyl)-3-(3,4-dimethoxyphenyl)acryloyl]morpholine (page 351).

Fosetyl (general name) means ethyl hydrogen phosphonate (page 530). Fosetyl may be used as a salt such as aluminium salt and the like.

The microbicidal composition of the present invention can be used for controlling disease caused by *Pyricularia oryzae*, *Cochliobolus miyabeanus* and *Rhizoctonia solani* of rice, *Erysiphe graminis*, f. *sp. hordei*, f. *sp. tritici*, *Gibberella zeae*, *Puccinia striiformis*, *P. graminis*, *Precondita*, *P. hordei*, *Typhula* sp., *Micronectriella nivalis*, *Ustilago tritici*, *U. nuda*, *Tilletia caries*, *Pseudocercospora herpotrichoides*, *Rhizoctonia cerealis*, *Rhynchosporium secalis*, *Septoria tritici* and *Leptosphaeria nodorum* of cereal, *Diaporthe citri* *Elsinoe fawcetti*, *Penicillium digitatum*, and *P. italicum* of oranges, *Sclerotinia mali*, *Valsa mali*, *Podosphaera leucotricha*, *Alternaria mali* and *Venturia inaequalis* of apple, *Venturia nashicola*, *Alternaria kikuchiana* and *Gymnosporangium haraeaeum* of pear, *Sclerotinia cinerea*, *Cladosporium carnophilum* and *Phomopsis* sp. of peach, *Plasmopara viticola*, *Elsinoe ampelina*, *Glomerella cingulata*, *Uncinula necator* and *Phakopsora ampelopsidis* of vine, *Gloeosporium kaki*, *Cercospora kaki* and *Mycosphaerella nawae* of persimmon, *Pseudoperonospora cubensis* of cucumber, *Colletotrichum lagenarium*, *Sphaerotheca fuliginea*, *Mycosphaerella melonis* of

Cucurbitaceae plants, *Alternaria solani*, *Cladosporium fulvum* and *Phytophthora infestans* of tomato, *Phomopsis vexans* and *Erysiphe cichoracearum* of egg plant, *Alternaria japonica* and *Cercospora brassicae* of Cruciferae plants, *Puccinia allii* of Welsh onion, *Cercospora kikuchii*, *Elsinoe glycines* and *Diaporthe phaseolorum* var. *sajae* of soybean, *Colletotrichum lindemthianum* of kidney bean, *Mycosphaerella personatum* and *Cercospora arachidicola* of peanut, *Erysiphe pisi* and *Peronospora pisi* of garden pea, *Peronospora viciae* and *Phytophthora nicotianae* of broad bean, *Alternaria solani* and *Phytophthora infestans* of potato, *Sphaerotheca humuli* and *Phytophthora nicotianae* of strawberry, *Exobasidium reticulatum* and *Elsinoe leucospila* of tea, *Alternaria longipes*, *Erysiphe cichoracearum*, *Colletotrichum tabacum* and *Phytophthora parasitica* of tobacco, *Cercospora beticola*, *Diplocarpon rosae*, *Sphaerotheca pannosa* and *Phytophthora megasperma* of rose, *Septoria chrysanthemiindici* and *Puccinia horiana* of chrysanthemum, *Botrytis cinerea* and *Sclerotinia sclerotiorum* of various crops, and various diseases caused by *Pythium* sp. In particular, the microbicidal composition of the present invention shows the superior effects by its synergistic microbicidal effects in controlling Oomycetes diseases caused by such as *Peronospora*, *Phytophthora* and *Pythium* sp.

In the microbicidal composition of the present invention, a mixing ratio of Compound (I) and Compound (II) is not limited to specified ones. An amount of at least one compound selected from the group consisting of ethylenebis(dithiocarbamate) compound, copper compound, phthalimide microbicidal compound, chlorothalonil and fosetyl is usually in the range of 0.1 to 100 parts by weight, preferably 0.5 to 50 parts by weight based on 1 part by weight of Compound (I). An amount of the anilide microbicidal compound is usually in the range of 0.01 to 20 parts by weight, preferably 0.1 to 10 parts by weight based on 1 part by weight of Compound (I). An amount of cymoxanil is usually in the range of 0.1 to 100 parts by weight, preferably 0.5 to 50 parts by weight based on 1 part by weight of Compound (I). The amount of dimethomorph is usually in the range of 0.1 to 50 parts by weight, preferably 0.2 to 10 parts by weight based on 1 part by weight of Compound (I).

The microbicidal composition of the present invention can be used merely by mixing Compound (I) and Compound (II). However, the microbicidal composition of the present invention is usually used by formulating preparations such as water dispersible powder, suspension, granule, dry-flowable agent, emulsifiable concentrate, liquid formulation, oil solution, smoking agent, aerosol agent and microcapsule, by mixing Compound (I) and Compound (II), mixing the mixture with solid carrier, liquid carrier and/or gaseous carrier and, if necessary, adding thereto an adjuvant for preparations such as surfactant, adhesive agent, dispersing agent and stabilizing agent. Alternatively, the microbicidal composition of the present invention may be used by formulating Compound (I) and Compound (II) into preparations separately, diluting each preparation with water and mixing both preparations. The total amount of active ingredient compounds contained in these preparations is usually 0.1 to 99% by weight, preferably 0.2 to 90% by weight.

In a further embodiment, the two compound formulations comprising I and II can be applied to the plant to be treated separately in consecutive order.

Examples of the solid carrier are pulverized or particulate clay (such as kaolin clay, diatomaceous earth, synthetic hydrated silicon oxide, attapulgite clay, bentonite and acid clay), talcs, other inorganic minerals (such as sericite, quartz powder, sulfur powder, activated carbon, calcium carbonate and hydrated silica), and salt for chemical fertilizer (such as ammonium sulfate, ammonium phosphate, ammonium nitrate, urea and ammonium chloride). Examples of the liquid carrier are water, alcohols (such as methanol and ethanol), ketones (such as acetone, methyl ethyl ketone and cyclohexanone), aromatic hydrocarbons (such as benzene, toluene, xylene, ethylbenzene and methyl-naphthalene), aliphatic hydrocarbons (such as hexane and kerosene), esters (such as ethyl acetate and butyl acetate), nitriles (such as acetonitrile and isobutyronitrile), ethers (such as dioxane and diisopropyl ether), acid amides (such as dimethylformamide and dimethylacetamide), halogenated hydrocarbons (such as dichloroethane, trichloroethylene and carbon tetrachloride). Examples of the gaseous carrier are butane gas, carbonic acid gas and fluorocarbon gas.

Examples of the surfactant are alkylsulfuric ester, alkylsulfonate, alkylarylsulfonate, alkyl aryl ether and its polyoxyethylene compound, polyethylene glycol ether, multivalent alcohol ester and sugar alcohol derivative.

Examples of the adhesive agent and the dispersing agent are casein, gelatin, polysaccharides (such as starch, acacia, cellulose derivative and alginic acid), lignin derivatives, bentonite, sugars, and synthetic water-soluble polymers (polyvinyl alcohol, polyvinyl pyrrolidone and polyacrylic acid). Examples of the stabilizing agent are PAP (acid isopropyl phosphate), BHT (2,6-di-tert-butyl-4-methylphenol), BHA (mixture of 2-tert-butyl-4-methoxyphenol and 3-tert-butyl-4-methoxyphenol), vegetable oil, mineral oil, and fatty acids or esters thereof.

The above-described preparations are applied to plants or soil as they are or by diluting with water or the like. When the preparations are applied to soil, they may be sprayed to the surface of the soil or may be used by applying in admixture with the soil. Alternatively, the preparations may be applied by various methods such as seed treatment method and ULV method. When the preparations are used as a seed treating agent, they are used by seed coating treatment, seed soaking treatment, seed spraying treatment or the like.

The microbicidal composition of the present invention may be used together with other microbicidal agents, insecticides, acaricides, nematocides, herbicides, seed disinfectants, fertilizers, soil conditioners and the like.

The amount of application of the microbicidal composition of the present invention depends upon kind of active ingredient compound, mixing ratio of Compound (I) and Compound (II), weather conditions, preparation form, application time, application method, application place, subject disease damage, subject crop and the like and the total amount

of the active ingredient compounds is usually 0.001 to 1000g/are, preferably 0.1 to 100g/are. When emulsifiable concentrate, water dispersible powder, suspension, liquid formulation or the like are applied, the application concentration is usually 0.0001 to 1% by weight, preferably 0.001 to 0.5% by weight. Granule, powder or the like are applied as they are without dilution. Upon seed treatment, the total amount of active ingredient compounds to be applied is usually 0.001 to 50g/kg seed, preferably 0.01 to 10g/kg seed.

The following Preparation Examples and Test Examples illustrate the present invention in detail but are not to be construed to limit the scope thereof.

"Part" means "part by weight" unless otherwise indicated.

Preparation Example 1

One part of Compound (Ia), (Ib), (Ic), (Id), (Ie), (If), (Ig) or (Ih); 5 parts of zineb, maneb, manzeb, inorganic salt of copper, organic salt of copper, folpet, captan, captafol, chlorothalonil, metalaxyl, benalaxyl, furalaxyl, ofurace, oxadixyl, cyprofuram, cymoxanil, dimethomorph or fosetyl; one part of synthetic hydrated silicon oxide; 2 parts of calcium lignin sulfonate; 30 parts of bentonite and 61 parts of kaolin clay are well ground and mixed, water is added thereto to well knead together, followed by granulation and drying to obtain granules.

Preparation Example 2

5 Parts of Compound (Ia), (Ib), (Ic), (Id), (Ie), (If), (Ig) or (Ih); 5 parts of zineb, maneb, manzeb, inorganic salt of copper, organic salt of copper, folpet, captan, captafol, chlorothalonil, metalaxyl, benalaxyl, furalaxyl, ofurace, oxadixyl, cyprofuram, cymoxanil, dimethomorph or fosetyl; one part of synthetic hydrated silicon oxide; 2 parts of calcium lignin sulfonate; 30 parts of bentonite and 57 parts of kaolin clay are well ground and mixed, water is added thereto to well knead together, followed by granulation and drying to obtain granules.

Preparation Example 3

0.5 Part of Compound (Ia), (Ib), (Ic), (Id), (Ie), (If), (Ig) or (Ih); 2.5 parts of zineb, maneb, manzeb, inorganic salt of copper, organic salt of copper, folpet, captan, captafol, chlorothalonil, metalaxyl, benalaxyl, furalaxyl, ofurace, oxadixyl, cyprofuram, cymoxanil, dimethomorph or fosetyl; 86 parts of kaolin clay and 11 parts of talc are well ground and mixed to obtain powders.

Preparation Example 4

5 Parts of Compound (Ia), (Ib), (Ic), (Id), (Ie), (If), (Ig) or (Ih); 25 parts of zineb, maneb, manzeb, inorganic salt of copper, organic salt of copper, folpet, captan, captafol, chlorothalonil, metalaxyl, benalaxyl, furalaxyl, ofurace, oxadixyl, cyprofuram, cymoxanil, dimethomorph or fosetyl; 3 parts of polyoxyethylen sorbitan monooleate; 3 parts of carboxymethyl cellulose and 64 parts of water are mixed and wet-ground to the particle size of less than 5 microns to obtain suspensions.

Preparation Example 5

10 Parts of Compound (Ia), (Ib), (Ic), (Id), (Ie), (If), (Ig) or (Ih); 50 parts of zineb, maneb, manzeb, inorganic salt of copper, organic salt of copper, folpet, captan, captafol, chlorothalonil, metalaxyl, benalaxyl, furalaxyl, ofurace, oxadixyl, cyprofuram, cymoxanil, dimethomorph or fosetyl; 3 parts of calcium lignin sulfonate; 2 parts of sodium lauryl sulfate and 35 parts of synthetic hydrated silicon oxide are well ground and mixed to obtain water dispersible powders.

The following Test Examples indicate that the microbicidal composition of the present invention has the excellent disease controlling activity.

The controlling effect, which is expected when treatment is carried out by mixing the given two kinds of active ingredient compounds, is generally calculated according to the following Colby equation.

$$E = X + Y - \frac{X \times Y}{100}$$

X: Controlling value (%) when treatment is carried out by using an active ingredient compound A at the concentration of m ppm

Y: Controlling value (%) when treatment is carried out by using an active ingredient compound B at the concentration of n ppm

E: Controlling value (%) when treatment is carried out by using the active ingredient compound A at the concentration of m ppm and the active ingredient compound B at the concentration of n ppm (hereinafter referred to as "expected controlling value")

If the controlling value (%) when treatment is carried out by actually mixing two kinds of active ingredient compounds is greater than the expected controlling value (%), it can be said that there is the synergistic effect in a combination of those compounds.

Test Example 1

Sandy loam was filled into a plastic pot, a vine (Berry A) was seeded thereto, the vine was grown for 40 days in a greenhouse. A test preparation, which had been formulated into a water dispersible powder according to Preparation Example 5, was diluted with water to a predetermined concentration. The diluted test preparation was sprayed to foliage of a vine seedling having developed three leaves so as to effectively attach to the leaf surface. Then, the seedling was spray-inoculated with a zoosporangium suspension of *Plasmopara viticola*. After inoculation, the seedling was placed under high humidity at 23 °C overnight, grown for 7 days in a greenhouse, severity (%) was investigated and the actual controlling value (%) was obtained according to the following equation.

$$\text{Controlling value (\%)} = \{[\text{Severity of non-treated plant (\%)} - \text{severity of treated plant (\%)}] / [\text{severity of non-treated plant (\%)}]\} \times 100$$

The results are shown in Table 2

Table 2

Test compound	Concentration of active ingredient (ppm)	Actual controlling value (%)	Expected controlling value (%)
(Ia)+manzeb	0.8+11	90	63
(Ib)+manzeb	0.8+11	94	74
(Ic)+manzeb	0.8+11	90	66
(Ia)+copper oxychloride	0.8+11	83	60
(Ic)+copper oxychloride	0.8+11	80	64
(Ig)+copper oxychloride	0.8+11	90	72
(Ia)+folpet	0.8+8	90	55
(Ib)+folpet	0.8+8	92	67
(Id)+folpet	0.8+8	88	60
(Ia)+chlorothalonil	0.8+10	70	53
(Ic)+chlorothalonil	0.8+10	70	57
(Ig)+chlorothalonil	0.8+10	80	67
(Ia)+metalaxyl	0.8+0.5	90	68
(Ib)+metalaxyl	0.8+0.5	95	76
(Ig)+metalaxyl	0.8+0.5	95	77
(Ib)+cymoxanil	0.8+30	82	67
(Ic)+cymoxanil	0.8+30	76	60
(Id)+cymoxanil	0.8+30	70	51
(Ia)+dimethomorph	0.8+1	85	60
(Ic)+dimethomorph	0.8+1	85	64
(Ig)+dimethomorph	0.8+1	90	72
(Ia)+fosetyl	0.8+8	90	50
(Ib)+fosetyl	0.8+8	95	63
(Id)+fosetyl	0.8+8	90	45
(Ia)	0.8	50	-
(Ib)	0.8	63	-
(Ic)	0.8	55	-
(Id)	0.8	45	-
(Ig)	0.8	65	-
Manzeb	11	25	-
Copper oxychloride	11	20	-
Folpet	8	10	-
Chlorothalonil	10	5	-
Metalaxyl	0.5	35	-
Cymoxanil	30	10	-

Table 2 (cont'd)

Test compound	Concentration of active ingredient (ppm)	Actual controlling value (%)	Expected controlling value (%)
Dimethomorph	1	20	-
Fosetyl	8	0	-

Test Example 2

Sandy loam was filled into a plastic pot, a tomato (Ponterosa) was seeded thereto, the tomato was grown for 20 days in a greenhouse. A test preparation, which had been formulated into a suspension according to Preparation Example 4, was diluted with water to a predetermined concentration. The diluted test preparation was sprayed to foliage of a tomato seedling having developed two true leaves so as to effectively attach to the leaf surface. Then, the seedling was spray-inoculated with a zoosporangium suspension of Phytophthora infestans. After inoculation, the seedling was placed under high humidity at 23 °C overnight, grown for 4 days in a greenhouse, severity (%) was investigated and the actual controlling value (%) was obtained according to the above equation.

The results are shown in Table 3

Table 3

	Test compound	Concentration of active ingredient (ppm)	Actual controlling value (%)	Expected controlling value (%)
5	(la)+manzeb	12.5+12.5	100	90
	(lb)+manzeb	12.5+12.5	100	95
	(ld)+manzeb	12.5+12.5	100	85
10	(lb)+chlorothalonil	12.5+12.5	100	95
	(lc)+chlorothalonil	12.5+12.5	100	96
	(ld)+chlorothalonil	12.5+12.5	100	85
	(la)+metalaxyl	12.5+12.5	100	85
15	(lb)+metalaxyl	12.5+12.5	100	93
	(lc)+metalaxyl	12.5+12.5	100	94
	(ld)+metalaxyl	12.5+12.5	100	78
20	(le)+metalaxyl	12.5+12.5	100	94
	(lf)+metalaxyl	12.5+12.5	100	90
	(lg)+metalaxyl	12.5+12.5	100	94
	(lh)+metalaxyl	12.5+12.5	100	93
25	(lb)+cymoxanil	12.5+50	100	93
	(lc)+cymoxanil	12.5+50	100	95
	(lg)+cymoxanil	12.5+50	100	95
30	(la)+dimethomorph	12.5+12.5	100	92
	(lc)+dimethomorph	12.5+12.5	100	95
	(lg)+dimethomorph	12.5+12.5	100	95
35	(la)	12.5	80	-
	(lb)	12.5	90	-
	(lc)	12.5	92	-
	(ld)	12.5	70	-
40	(le)	12.5	92	-
	(lf)	12.5	86	-
	(lg)	12.5	92	-
	(lh)	12.5	90	-
45	Manzeb	12.5	50	-
	Chlorothalonil	12.5	50	-
	Metalaxyl	5	25	-
50	Cymoxanil	50	33	-
	Dimethomorph	12.5	60	-

55

The following Preparation Example illustrates the preparation of Compound (I) used in the present invention
Reference Preparation Example [Preparation of Compound (le)]

Carbon disulfide (2.0g, 26mmol) was added to a mixture of 4-ethoxy-3-fluoroaniline (2.7g, 17mmol) and triethylamine (4.0g, 40mmol) while stirring. The mixture was stirred at room temperature for 10 hours, N,N-dimethylformamide

(30ml) was added thereto and methyl iodide (2.2g, 16mmol) was added dropwise. The mixture was stirred at room temperature for 30 minutes and dilute hydrochloric acid was added thereto, followed by extraction with diethyl ether. The organic layer was washed with a saturated sodium chloride solution, dried with anhydrous sodium sulfate and concentrated under reduced pressure. The residue was subjected to silica gel column chromatography (elution solvent: hexane ethyl acetate=4 1) to obtain methyl 4-ethoxy-3-fluorophenyldithiocarbamate (2.5g, 10mmol) as crystals (m.p. 108.0 °C).

Sodium hydride (60% oil dispersion, 60mg, 1.5mmol) was added to a solution of 4-ethoxy-3-fluorophenyldithiocarbamate (0.40g, 1.6mmol) in tetrahydrofuran (20ml) at room temperature. The mixture was stirred at room temperature for 30 minutes and (E)-methoximino-2-(2-bromomethylphenyl)-N-methylacetamide (0.42g, 1.5mmol) was added thereto. The mixture was stirred at room temperature for 30 minutes and water was added thereto, followed by extraction with ethyl acetate. The organic layer was dried with anhydrous magnesium sulfate and concentrated under reduced pressure. The residue was subjected to silica gel column chromatography (elution solvent: hexane ethyl acetate=1 1) to obtain (E)-2-methoximino-2-[2-(4-ethoxy-3-fluorophenylimino)-(methylthio)methylthiophenyl]-N-methylacetamide (0.60g, 1.3mmol) as an oil.

¹H-NMR (CDCl₃/TMS, δ (ppm)) 1.26 (3H, t, J=7.1Hz), 2.45 (3H, s), 2.88 (3H, d, J=4.6Hz), 2.95 (3H, s), 4.12 (2H, q, J=7.1Hz), 4.22 (2H, br s), 6.55-7.50 (8H, m)

Some NMR data of the other compounds used in the present invention are shown below.

Compound (Ia):

¹H-NMR (CDCl₃/TMS, δ (ppm)) 2.46 (3H, s), 2.89 (3H, d, J=5.0Hz), 3.95 (3H, s), 4.21 (2H, br s), 6.51-7.46 (8H, m)

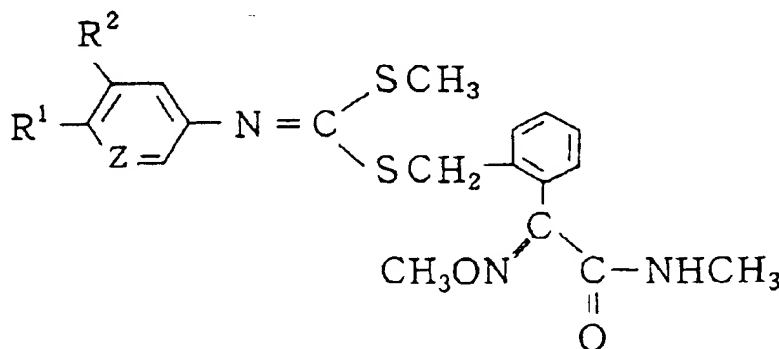
Compound (If):

¹H-NMR (CDCl₃/TMS, δ (ppm)) 2.31 (3H, s), 2.44 (3H, s), 2.86 (3H, d, J=5.0Hz), 3.95 (3H, s), 4.22 (2H, br s), 6.72-7.49 (9H, m)

Claims

1. Microbicidal compositions comprising as active ingredients:

(I) a dithiocarbonimide compound represented by the general formula:



wherein Z represents a CH group or a nitrogen atom, R¹ and R² are the same or different and represent a hydrogen atom, a C₁-C₆ alkyl group, a halogen atom, a C₁-C₆ alkoxy group, a C₁-C₆ haloalkyl group or a C₁-C₆ haloalkoxy group, or R¹ and R² are taken together to form a methylenedioxy group optionally substituted with fluorine atoms, and

(II) at least one compound selected from the group consisting of ethylenebis(dithiocarbamate) compound, copper compound, phthalimide microbicidal compound, chlorothalonil, anilide microbicidal compound, cymoxanil, dimethomorph and fosetyl.

2. The microbicidal composition according to claim 1, wherein the ethylenebis(dithiocarbamate) compound is at least one member selected from the group consisting of zineb, maneb and manzeb, the copper compound is at least one member selected from the group consisting of inorganic salt of copper and organic salt of copper, the phthalimide microbicidal compound is at least one member selected from the group consisting of folpet, captan and captafol,

and the anilide microbicial compound is at least one member selected from the group consisting of metalaxyl, benalaxyl, furalaxyl, ofurace, oxadixyl and cyprofuram.

5 3. A method of controlling Oomycetes fungi diseases, which comprises applying the compositions as defined in claim 1 or 2 to a locus where Oomycetes fungi propagate.

4. Use of the compositions as defined in claim 1 or 2 for controlling Oomycetes fungi diseases.

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European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 97 10 3238

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
D, A	EP 0 656 351 A (SUMITOMO CHEMICAL COMPANY) 7 June 1995		A01N47/42 //(A01N47/42, 59:20, 57:12, 47:34, 47:14, 47:04, 43:84, 37:46, 37:34)
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			A01N
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		4 June 1997	Fort, M
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application I : document cited for other reasons & : member of the same patent family, corresponding document	

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